

1      **CLAIMS**

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3      What is claimed is:

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5      1. A method of introducing legacy-compatible supplemental training waveform  
6      components into ATSC-compatible DTV transmission waveforms by exploiting  
7      ancillary data capability in said standard.

8

9      2. A method of introducing said legacy-compatible supplemental training waveform  
10     components per claim 1 by anticipating transmission signal processing, and  
11     compensating for same, in the generation and queueing of relevant ancillary data  
12     packets so as to induce the designed training waveform components, while  
13     preserving enough information in relevant ancillary data packets so as to allow  
14     legacy and future receivers to distinguish these training waveform induction  
15     packets from desired information-bearing packets.

16

17     3. A method of introducing said legacy-compatible supplemental training waveform  
18     components per claim 1 at the transmission point by introducing appropriate  
19     “placeholder” packets in the packet data stream, then generating intentionally  
20     designed supplemental training waveform components in the modulation  
21     waveform at time instances corresponding to those which map from the  
22     “placeholder” training symbol induction packets while passing sufficient data,

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1 undisturbed, from same placeholder packets so as to cause legacy and future  
2 receivers to distinguish those placeholder packets from desired information-  
3 bearing packets.

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5 4. A method of introducing zero, one or more selectable legacy-compatible  
6 supplemental training waveform components into ATSC-compatible DTV  
7 transmission waveforms per the method of claim 1, said training waveforms  
8 selected from a plurality or ensemble of selections, where each selection or  
9 combination of selections is identifiable to the receiver through signaling means  
10 available through spare capacity in the ATSC DTV field sync segment or  
11 otherwise.

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13 5. A method of introducing zero, one or more selectable legacy-compatible  
14 supplemental training waveform components into ATSC-compatible DTV  
15 transmission waveforms per the method of claim 1, said training waveforms  
16 selected from a plurality or ensemble of selections, where each selection or  
17 combination of selections is identifiable to the receiver through signaling means  
18 available through information payload packets, or portions of information  
19 payload packets, designated for use as such.

20

21 6. A method of introducing zero, one or more selectable legacy-compatible  
22 supplemental training waveform components into ATSC-compatible DTV

1 transmission waveforms per the method of claim 1, said training waveforms  
2 selected from a plurality or ensemble of selections, where each selection or  
3 combination of selections is identifiable to the receiver through its correlation  
4 properties.

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6 7. A method of gradually improving multipath resilience of ATSC DTV standard  
7 broadcast and reception systems by gradually introducing, over time, various  
8 legacy-compatible supplementary training or reference waveforms for inclusion,  
9 selectively or otherwise, per the method of claim 1.

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11 8. A method of designing legacy-compatible supplemental training waveform  
12 components for introduction per method of claim 1 so as to derive maximum  
13 benefit, with respect to equalization subject to known channel multipath  
14 characteristics, through appropriate selection of length, periodicity and processing  
15 gain of same said supplemental training waveform components, said selection  
16 subject to pre-existing ATSC DTV transmission signal periodicities and  
17 configuration.

18

19 9. A method of exploiting, at the receiver, said legacy-compatible supplemental  
20 training waveform components introduced per method of claim 1 by employing  
21 those components to more quickly, frequently and/or reliably train pre-  
22 demodulation equalizers.

DETAILED DESCRIPTION

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2       10. A method of exploiting, at the receiver, said legacy-compatible supplemental  
3           training waveform components introduced per method of claim 1 by passing the  
4           received transmission waveform through a correlator, digital or otherwise, to  
5           extract multipath channel response characteristics for use in more quickly,  
6           frequently and/or reliably training pre-demodulation equalizers.

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8       11. A method of exploiting, at the receiver, said legacy-compatible supplemental  
9           training waveform components introduced per method of claim 1 by passing the  
10          received transmission waveform through a digital correlator, said correlator  
11          implemented with reduced complexity based on the use of bit shifts and sign  
12          changes instead of multiplication, yielding a correlator implementation limited to  
13          addition operations or to addition operations and a minimum number of bit shifts,  
14          and said correlation process for the purpose of extracting multipath channel  
15          response characteristics for use in more quickly, frequently and/or reliably  
16          training pre-demodulation equalizers.

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18       12. The method of modifying the ATSC DTV standard transmission format by  
19          reducing pilot signal amplitude by 20% in the interest of subsequently reducing  
20          computational complexity required of correlation-based training-waveform  
21          processing, or in the interest of improving the accuracy of said reduced-

1 complexity correlators over the accuracy possible with the presently specified  
2 pilot amplitude.

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4 13. A method of introducing legacy-compatible supplemental training waveform  
5 components into digital transmissions in general by exploiting packet-based  
6 information payloads.

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8 14. A method of introducing said legacy-compatible supplemental training waveform  
9 components per claim 13 by anticipating transmission signal processing, and  
10 compensating for same, in the generation and queueing of relevant ancillary data  
11 packets so as to induce the intentionally designed training waveform components  
12 while preserving enough information in relevant ancillary data packets so as to  
13 allow legacy and future receivers to distinguish these training waveform  
14 induction packets from desired information-bearing packets.

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16 15. A method of introducing said legacy-compatible supplemental training waveform  
17 components per claim 13 at the transmission point by introducing appropriate  
18 “placeholder” packets in the packet data stream, then generating designed  
19 supplemental training waveform components in the modulation waveform at time  
20 instances corresponding to those which map from the “placeholder” training  
21 symbol induction packets while passing sufficient data, undisturbed, from same

placeholder packets so as to cause legacy and future receivers to distinguish those placeholder packets from desired information-bearing packets.

16. A method of introducing zero, one or more selectable legacy-compatible supplemental training waveform components into digital transmission waveforms per the method of claim 13, said training waveforms selected from a plurality or ensemble of selections, where each selection or combination of selections is identifiable to the receiver through signaling means available through spare capacity in the modulation fields designed to convey configuration and control overhead information.

17. A method of introducing zero, one or more selectable legacy-compatible supplemental training waveform components into digital transmission waveforms ATSC-compatible DTV transmission waveforms per the method of claim 13, said training waveforms selected from a plurality or ensemble of selections, where each selection or combination of selections is identifiable to the receiver through signaling means available through information payload packets, or portions of information payload packets, designated for use as such.

18. A method of introducing zero, one or more selectable legacy-compatible supplemental training waveform components into digital transmission waveforms per the method of claim 13, said training waveforms selected from a plurality or

1 ensemble of selections, where each selection or combination of selections is  
2 identifiable to the receiver through new signaling means introduced into the  
3 legacy modulation waveform.

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5 19. A method of introducing zero, one or more selectable legacy-compatible  
6 supplemental training waveform components into digital transmission waveforms  
7 ATSC-compatible DTV transmission waveforms per the method of claim 13, said  
8 training waveforms selected from a plurality or ensemble of selections, where  
9 each selection or combination of selections is identifiable to the receiver through  
10 signaling means available through newly configured information payload  
11 packets, or new portions of legacy standard information payload packets,  
12 introduced for use as such.

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14 20. A method of introducing zero, one or more selectable legacy-compatible  
15 supplemental training waveform components into ATSC-compatible DTV  
16 transmission waveforms per the method of claim 13, said training waveforms  
17 selected from a plurality or ensemble of selections, where each selection or  
18 combination of selections is identifiable to the receiver through its correlation  
19 properties.

20

21 21. A method of designing legacy-compatible supplemental training waveform  
22 components for introduction per method of claim 13 so as to derive maximum

1 benefit, with respect to equalization subject to known channel multipath  
2 characteristics, through appropriate selection of length, periodicity and processing  
3 gain of same said supplemental training waveform components, said selection  
4 subject to pre-existing digital transmission signal periodicities and configuration  
5 and to payload packet periodicities and configuration.

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7 22. A method of exploiting, at the receiver, said legacy-compatible supplemental  
8 training waveform components introduced per method of claim 13 by employing  
9 those components to more quickly, frequently and/or reliably train pre-  
10 demodulation equalizers.

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12 23. A method of exploiting, at the receiver, said legacy-compatible supplemental  
13 training waveform components introduced per method of claim 13 by passing the  
14 received transmission waveform through a correlator, digital or otherwise, to  
15 extract multipath channel response characteristics for use in more quickly,  
16 frequently and/or reliably training pre-demodulation equalizers.

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18 24. A method of exploiting, at the receiver, said legacy-compatible supplemental  
19 training waveform components introduced per method of claim 13 by passing the  
20 received transmission waveform through a digital correlator, said correlator  
21 implemented with reduced complexity based on the use of bit shifts and sign  
22 changes instead of multiplication, yielding a correlator implementation limited to

1 addition operations or to addition operations and a minimum number of bit shifts,  
2 and said correlation process for the purpose of extracting multipath channel  
3 response characteristics for use in more quickly, frequently and/or reliably  
4 training pre-demodulation equalizers.

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